

redirection of the data write requests could then be effective either at the level of the client modules or at the level of the server modules or for both types of modules with the advantages described previously.

Therefore, the securing of access to the operating system and/or to certain files contained in the hard disk, and particularly, in a network system operated by numerous users, is assured thanks to the method of the invention which totally emulates the software of hard disks at the level of the data blocks or at the level of the file system, therefore permitting the use in emulated hard disks of any type of file systems accepted by the operating system.

## 10 Claims

1. Method for software emulation of hard disks of a data processing platform at the level of the operating system with parameterizable management on the fly of requests for writing and reading data, characterized by the fact that it consists of creating in a first step a representation of a real hard disk in which the orders of loading and execution of certain components of the operating system of a data processing platform may be modified, then in a second step loading on said data processing platform one or more peripheral drivers, among which at least one of the peripheral drivers permits real dialogue with a data storage support containing the data of the emulated hard disk, then simulating in a third step the behavior of a real hard disk for the operating system.

2. Method as claimed in claim 1, characterized in that the management of said data write requests that the operating system sends to the emulated hard disk is accomplished at the peripheral driver level and/or at the level of an optional hard disk server service on the network the written data being stored according to the parameterization of said peripheral drivers and/or said service server of the hard disk on the network

- either directly in the support containing the emulated hard disk,
- or in the memory, random access or virtual, accessible to the operating system using the emulated hard disk,

- or else in a volatile storage space accessible to the operating system using the emulated hard disk,
- or in a non-volatile storage space accessible to the operating system using the emulated hard disk,
- 5      • or in a volatile storage space accessible to the server service of emulated hard disks on a data processing network.
- or in a non-volatile storage space accessible to the server service of emulated hard disks on a data processing network.

3. Method as claimed in claim 1,

10 characterized in that the management of the data reading requests that the operating system issues to the emulated hard disk is accomplished at the peripheral driver level and/or at the level of an optional hard disk server service on the network, the readings of previously written data being performed in the storage space:

- 15      • either directly in the support containing the emulated hard disk,
- or in the random access or virtual memory accessible to the operating system using the emulated hard disk,
- or in a volatile storage space accessible to the operating system using the emulated hard disk,
- 20      • or in a nonvolatile storage space accessible to the operating system using the emulated hard disk,
- or in a volatile storage space accessible to the server service of emulated hard disks on a data processing network,
- or in a non-volatile storage space accessible to the server service of emulated hard disks on a data processing network.
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4. Method as claimed in claim 1,

characterized in that the emulation of the hard disk provided to the operating system of a client station is accomplished by the agency of a single, monolithic peripheral driver which communicates with the operating system in the manner of

a hard disk and which communicates with the support containing the data of said emulated hard disk in a manner specific to this support.

5. Method as claimed in claim 1,  
5 characterized in that the data of the emulated hard disk or disks are accessible to the client stations via a data processing network.

6. Method as claimed in claim 1,  
characterized in that if an emulated hard disk is to be started up, a low level micro-software module is responsible for access to the data contained in said  
10 emulated hard disk by providing an interface of the type of that provided by the micro-software having access to the data of real hard disks by the operating system started up at the client station.

7. Method as claimed in claims 5 and 6,  
characterized in that the micro-software could, in the case of computers using  
15 bootup memory programs of the PXE type (PXE bootup PROM), use the functions made available by these PROMS for controlling communications via the data processing network independently of the network interface model employed.

8. Method as claimed in claim 7,  
20 characterized in that the low level micro-software is loaded in the memory of the client station and executed by using the functions made available by a bootup PROM.

9. Method as claimed in claim 6,  
characterized in that the low level micro-software is loaded in the memory of the  
25 client station and executed as a component of the basic standard micro-software (BIOS, for example) of the client station, said low level micro-software providing the same functions as the access services on real hard disks normally provided by the basic standard micro-software.

10. Method as claimed in claim 6,  
characterized in that the low-level micro-software is loaded in the memory of the  
client station from a third party data support supported as a startup peripheral by  
the client station.

5        11. Method as claimed in claim 5,  
characterized in that at least one peripheral driver loaded and executed by the  
operating system of the client station provides the functions of access, via the data  
processing network, to the data contained in the emulated hard disks.

12. Method as claimed in claim 1,  
10        characterized in that if the data support containing the data of the emulated hard  
disk(s) is a support that does not support writing in real time, or the system of  
hard disk emulation according to the invention is parameterized not to accept the  
writing of data directly in the support containing the data of the emulated hard  
disk, the peripheral drivers providing the emulation of the hard disk at the client  
15        stations method the data writing requests issued by the operating system to the  
emulated hard disk(s) in such a way that the written data are stored in a storage  
space different from the data support containing the data of the emulated hard  
disk(s).

13. Method as claimed in claim 12,  
20        characterized in that the data writing requests issued by the client station  
operating system to the emulated hard disk(s) are processed in such a way that the  
written data are stored in the random access memory of the client station.

14. Method as claimed in claim 12,  
characterized in that the data writing requests issued by the client station  
25        operating system to the emulated hard disk(s) are processed in such a way that the  
written data are stored in the virtual memory of the client station.

15. Method as claimed in claim 12,  
characterized in that the data writing requests issued by the client station  
operating system to the emulated hard disk(s) are processed in such a way that the

written data are stored in a data file accessible to the operating system of the client station.

16. Method as claimed in claim 1,  
characterized in that the data writing requests issued by the operating system to  
5 the emulated hard disk(s) are, at a given moment, redirected to one and only one  
storage space; the storage space in which the written data are redirected may be  
changed on the fly during an operating session of the operating system of a client  
station.

17. Method as claimed in claim 12,  
10 characterized in that the storage space used for storage of the written data may be  
volatile, i.e. be emptied of data that are stored in each new operating session..of  
the client station operating system or nonvolatile so as to permit the written data  
of an operating session of the operating system to persist from one client station  
to another.

15 18. Method as claimed in claims 16 and 17,  
characterized in that the volatile character of the redirections of the written data is  
determined upon initialization of the operating session of the operating system of  
a client station.

19. Method as claimed in claim 1,  
20 characterized in that the data reading requests issued by the operating system may  
be performed in different storage spaces during an operating session of the  
operating system of a client station.

20. Method as claimed in claim 19,  
characterized in that the data reading requests issued by the operating system to  
25 an emulated hard disk carried out in different storage spaces are following an  
order of priority.

21. Method as claimed in claim 5,  
characterized in that a specific program called "server software" is in charge at  
one of the stations of the data processing network, on the one hand, of the

communications via the network with the client stations accessing the emulated hard disks, and on the other, of accessing the data support containing the data of the emulated hard disks.

22. Method as claimed in claim 21,

5 characterized in that if the hard disk emulation system is parameterized so that the data write requests received by the server software are intended for a specific emulated hard disk they are not redirected but stored directly in a support containing the data of the emulated hard disk itself, and only one client station can access said emulated hard disk at a given time.

10 23. Method as claimed in claim 21,

characterized in that in order to permit several client stations to access an emulated hard disk simultaneously, the server software is capable of redirecting specifically the data write requests issued by a client station A to a given storage space, and of redirecting the data write requests issued by another client station B  
15 to another given storage space.

24. Method as claimed in claim 1,

characterized in that in order to permit the startup from and/or simultaneous access to the same emulated hard disk or 100% identical copies of the same emulated hard disk, certain constituent components of the invention loaded and  
20 executed by the client stations or server software are capable of modifying, on the fly or before their effective use by the operating system, of certain data contained in the emulated hard disk.

25. Method as claimed in claim 1,

characterized in that the emulation itself is performed for the operating system of  
25 the client stations at the level of the class of virtual peripherals of the file system type as in the products Qualystem LiteNET PC 1.x and Qualystem LAN PC 2.x (CIFS or SMB file system) or Qualystem Rescue 1.x (ISO9660/Joliet, CDFS or UDF file System ).



26. Method as claimed in claim 1,  
characterized in that the emulation is performed for the operating system of the  
client stations at the level of the class of disk peripherals itself and not at the file  
system level. This type of emulation is employed, for example, in the products  
5 Qualystem LAN PC 3.x (data support for emulated hard disks residing on a server  
of a data processing network) or Qualystem Rescue 2.x and 3.x (data support of  
emulated disks residing in the startup part called El Torito of an optical disk, CD  
or DVD).

27. Method as claimed in claim 1,  
10 characterized in that the significant data contained in the emulated hard disk and  
are copied by a software tool executed at a reference station from a real hard  
disk called the reference hard disk that is accessible to the operating system of  
said reference station.

28. Method as claimed in claims 25 and 27,  
15 characterized in that the software tool creates an image directory that contains the  
data of the emulated hard disk.

29. Method as claimed in claims 26 and 27,  
characterized in that the software tool creates an image file that contains the data  
of the emulated hard disk.

20 30. Method as claimed in claim 1,  
characterized in that in order to permit startup from an emulated hard disk, the  
sequence of loading of the components of the operating system requires an  
adjustment so that all components of the operating system on which the  
peripheral drivers permitting access to the emulated hard disk according to the  
25 invention depend are loaded and usable at the moment when the operating system  
needs to access the emulated hard disk by using the peripheral drivers and no  
longer by using the firmware functions (BIOS).

31. Method as claimed in claim 21,  
characterized in that in order to accelerate the simultaneous access by several  
client stations to the same emulated hard disk whose data are contained in a data  
support accessible to the server station, the data are sent by the server station to  
5 the client stations within the scope of the hard disk emulation globally and at a  
single time by using the "broadcast" or "multicast" mechanisms instead of the  
"unicast" mechanism.

32. Method as claimed in claim 31,  
characterized in that the data sent by "broadcast" or by "multicast" by the server  
10 station are stored by the client stations that accept them in a local cache situated  
in the memory (real or virtual) of said client stations.

33. Method as claimed in claim 31,  
characterized in that a reading request for data in the emulated hard disk issued by  
the operating system of a client station generates an explicit data reading request  
15 sent to the server station only if said data are not already present in said local  
cache.

34. Method as claimed in claim 33,  
characterized in that the data read in the local cache are removed after being read  
by the client station so as to free up space in said local cache.

20 35. Method as claimed in claim 31,  
characterized in that the decision to send, within the scope of the hard disk  
emulation according to the invention, of data by "multicast/broadcast" or  
"unicast" is made at the server module level which provides the functionalities  
necessary for the hard disk emulation at the client stations.

25 36. Method as claimed in claim 31,  
characterized in that the client stations may modify their subscription to receiving  
the data sent via "broadcast/multicast" by the server station within the scope of  
emulation of hard disks according to the invention.



37. Method as claimed in claim 32,  
characterized in that the client stations may erase the data from the local cache  
after a certain parameterizable time.

38. Method as claimed in claim 5,  
5 characterized in that the server module making the data contained in the emulated  
hard disks available to client stations may use any suitable network protocol.

39. Method as claimed in claims 5 and 6,  
characterized in that the low level software program executed by the client  
stations and permitting access to the data contained in the emulated hard disks  
10 may use any suitable network protocol.

40. Method as claimed in claim 11,  
characterized in that the peripheral driver(s) according to the invention executed  
by the client stations and permitting access to the data contained in the emulated  
hard disks may use any suitable network protocol.

15 41. Method as claimed in claim 21,  
characterized in that if the data support containing the data of the emulated hard  
disk(s) is a support that does not support writing in real time, or the system of  
hard disk emulation according to the invention is parameterized not to accept the  
write operations directly in the support containing the data of the emulated hard  
20 disk, the server software providing the emulation of the hard disk at the client  
stations processes the data write requests issued by the operating system to the  
emulated hard disk(s) in such a way that the written data are stored in a storage  
space different from the data support containing the data of the emulated hard  
disk(s).

25 42. Method as claimed in claim 21,  
characterized in that the data write requests issued by the client station operating  
system to the emulated hard disk(s) are processed in such a way that the written  
data are stored in the random access memory of the server station.

43. Method as claimed in claim 21,  
characterized in that the data write requests issued by the client station operating system to the emulated hard disk(s) are processed in such a way that the written data are stored in the virtual memory of the server station.

5        44. Method as claimed in claim 21,  
characterized in that the data write requests issued by the client station operating system to the emulated hard disk(s) are processed in such a way that the written data are stored in a data file accessible to the server software.

10       45. Method as claimed in claim 21,  
characterized in that the storage space used for storage of the written data may be volatile, i.e. be emptied of data that are stored in each new operating session of the client station operating system or nonvolatile so as to permit the written data of an operating session of the operating system to persist from one client station to another.

15       46. Method as claimed in claims 16 and 21,  
characterized in that the volatile character of the redirections of the written data is determined upon initialization of the operating session of the operating system of a client station.